U. S. DEPARTMENT OF AGRICULTURE - FOREST SERVICE
CALIFORNIA FOREST AND RANGE EXPERIMENT STATION
Division of Forest Insect Investigations

# FOREST INSECT CONDITIONS
# MOUNT LAGUNA RECREATION AREA
# CLEVELAND NATIONAL FOREST
# FEBRUARY 1954
# APPRAISAL SURVEY

The Mount Laguna Recreational Area in the Cleveland National Forest has, for a long time, posed a difficult problem of protection from forest insects. Part of this stems from the fact that most of the area is marginal from the standpoint of tree growth. The area is generally of poor site quality where there is a constant struggle of trees for survival. Insect control has been undertaken in this area in various degrees of intensity since 1929. These programs have been rather sporadic and, for the past four years, no control has been carried on except against the western pine beetle in Coulter pine, which represents only a very small segment of the stand in need of protection against insects. The California flatheaded borer has been in an epidemic status in this area for several years. During January 1953, an appraisal survey of this area was attempted to determine the extent of insect damage for 1952, but the results were not considered reliable enough to warrant modifying the control program.

In early February 1954, another appraisal was conducted to determine the 1953 loss. Those participating in this survey were R. C. Hall, M. M. Furniss and G. L. Downing of the CF&RES, together with J. L. Averell from the Division of Timber Management of the Regional Office and R. M. Rice from the Descanso Ranger District of the Cleveland National Forest. The area covered totaled approximately 7,500 timbered acres. It was sampled by the use of circular 1/2 acre plots established at 5 chain intervals along cruise lines spaced approximately 30 chains apart. This resulted in a cruise of approximately 3.2% of the timbered acres. The usual intensity of cruise for such an appraisal has been 2.5%, but more precise information was desired for this particular area.

## Insect and Host Species

The major timber species in this area is Jeffrey pine with a small amount of Coulter pine in mixture with the Jeffrey pine in the northern limits of the area. Incense cedar also occurs, but is very limited in its distribution and is of little consequence as a timber species. The principal primary insect species are the California flatheaded borer (Melanophila californica Van Dyke) and the Oregon pine engraver (Ips oregoni, (Eichh.)) attacking Jeffrey pine and the western pine beetle (Dendroctonus brevicomis Lec.) and the California five-spined engraver (Ips confusus (Lec.)) attacking Coulter pine. The principal secondary insect species is the red turpentine beetle (Dendroctonus valens Lec.) attacking both Jeffrey and Coulter pine.

## Status and Scope of the Infestation

The California flatheaded borer still remains in the epidemic stage, although there are indications that the 1953 loss is somewhat lower than that for 1952.

The western pine beetle in Coulter pine is at a low endemic level, presumably as the result of intensive maintenance control work carried out against this insect for the past two years. One characteristic of the flathead infestation in Jeffrey pine is that it is well distributed throughout all diameter classes and apparently little preference is shown for any one diameter class. The average tree attacked is 16 inches in diameter at breast height and contains about 150 board feet. Because of this, volume loss is relatively low while the number of trees per unit area is relatively high. The appraisal estimate for the 1953 loss (Table 1) is .77 trees per acre or about 500 trees per section, while the volume estimate is 107 board feet per acre. Because the total green stand volume is low, estimated at about 6,500 board feet per acre, this means the per cent of stand lost in 1953 is 1.64%, or more than three times estimated normal loss. This estimate is well under our expected sampling error of 20% at the 68% confidence level, being 17.4 for volume and 9.6% for the number of trees.

Risk Element in the Laguna Area

In April 1948, J. W. Bongberg proposed a sanitation-salvage cutting in the Laguna Area to reduce the insect hazard, but for various reasons it was not possible to interest operators in this type of cutting. Following the recent appraisal, a sample area of $2\frac{1}{2}$ acres was selected as a demonstration plot to show interested operators the type of tree and amount of volume suggested for removal in a sanitation -salvage operation. This particular plot is considered to represent one of the highest hazard zones in the area and probably represents the extreme in this respect. Table 3 presents a summary of the conditions found on the plot selected. The distribution by risk in this plot is as follows: Risk 1, 430 board feet per acre or 4.9%; risk 2, 4,040 board feet per acre or 46.5%; risk 3, 2,850 board feet per acre or 32.9%; and risk 4, 1,360 board feet per acre or 15.7%. The volume of low risk is 4,470 board feet or 51.4%, and high risk 4,210 board feet per acre or 48.6%. One of the characteristics of the plot is the low percentage in risk 1 and the high percentage in risk 3. Another characteristic is the very high percentage of high risk material in the diameter between 12 and 20 inches. In both of these respects, the area is drastically different from most eastside stands in the northern forests.

Control Consideration

There are several factors to be considered in any control recommendation for the Laguna area, but the most important is the values at stake. These must be considered from the recreational viewpoint, since this is primarily a recreational area. There seems to be no acceptable formula for determining such values, but certainly, in this case, the recreational values far outweigh the intrinsic values as represented in merchantable stumpage and, as such, would warrant a higher level of insect protection than would be justified for commercial timberland.

To date we do not have a fully satisfactory method of control for the California flatheaded borer. At the present time, experiments are being conducted on several other areas to control the insect by direct methods - cut-peel-burn, or cut-spray, but these studies are not far enough along to advocate such methods for an area as large as the one involved in this infestation. Such a program

would involve an initial expenditure of over $100,000 for the first year to treat the 6,000 trees known to be infested. Conventional sanitation-salvage logging, involving the removal of merchantable risk 3 and 4 trees, can not be expected to solve the current problem because of the high proportion of trees in unmerchantable sizes, as may be seen from Table 3. Note, for example, that on the demonstration plot there are 48 trees in the risk 3 group, but that 47 of these are unmerchantable under standard logging practice. In the risk 4 group there are 31 trees, and 30 of them are unmerchantable. A conventional sanitation-salvage operator would remove only 2 out of 79 high risk trees. Therefore, this method can not at present be advocated unless some market can be developed for the large numbers of high risk trees in the smaller diameter groups.

Neither of the above methods appears to be feasible. However, perhaps sprays applied to control the adults would be effective, for the beetles have one habit which may make them vulnerable. During the first ten days after emergence, they spend much of their time feeding on the pine foliage in the sunlight. West 1/ found that this feeding habit is necessary for the beetles to attain sexual maturity, and that no copulation or oviposition took place under caged conditions unless they were permitted to feed on fresh foliage. R. Z. Callaham observed the same feeding habit in the Laguna Area during his studies in the summer of 1950. It would, therefore, appear that the adults might be susceptible to DDT applied to the foliage.

Recommendations:

In view of the considerations discussed in the preceding section of this report, the following action is recommended during 1954:

1. Small scale tests should be conducted by the Division of Forest Insect Research to determine the possibilities of controlling California flatheaded borer adults with DDT applied to the foliage.

2. The Division should obtain information on the pattern and duration of emergence of flatheaded borer adults in the Mt. Laguna Area.

3. Pending the outcome of results of this season's work, no action should be taken to develop plans for field trials of aerial sprays of DDT at Mt. Laguna this year.

Berkeley, California
April 29, 1954

R. C. Hall, Entomologist
M. M. Furniss, Forester
G. L. Downing, Entomologist

1/ West, A. S. Jr. The California Flatheaded Borer Melanophila californica Van Dyke in Ponderosa Pine Stands of Northeastern California, Canadian Journal of Research D,25 97-118, June 1947

Table 1

Estimated Jeffrey pine losses from the California Flatheaded Borer for the 1953 season. 7,5000 Timbered Acres, Laguna Area.

| Estimated Green Stand Vol. | Trees Killed | | | | |
|---|---|---|---|---|---|
| Board Feet Per Acre | No. Per Acre | Total for Area | Volume Per Acre | Killed % Stand | Board Feet Total for Area |
| 6,500 | 0.77±.075 | 5,775±562 | 107±19 | 1.64 | 802,500±139,640 |

Table 2

Distribution of Loss by Diameter - From 483 Circular 1/2 Acre Sample Plots

| Inches | No. Trees |
|---|---|
| 4 | 18 |
| 6 | 24 |
| 8 | 20 |
| 10 | 22 |
| 12 | 26 |
| 14 | 20 |
| 16 | 14 |
| 18 | 13 |
| 20 | 8 |
| 22 | 8 |
| 24 | 3 |
| 26 | 2 |
| 28 | 3 |
| 30 | 1 |
| 32 | 1 |
| 34 | 1 |
| 36 | 1 |
| Total | 186 |

Table 3

Stand Inventory on Risk Demonstration Plot

Mount Laguna Area

Plot: Mt. Laguna

Size: 2½ Acres

| | Low Risk | | | | High Risk | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| DBH | Risk I | | Risk II | | Risk III | | Risk IV | | All Risk | |
| Class | No. Trees | Volume | No. Trees | Volume | No. Trees | Volume | No. Trees | Volume | No. Trees | Volume |
| 12 | | | 25 | 750 | 17 | 510 | 15 | 450 | 57 | 1710 |
| 14 | | | 18 | 1440 | 18 | 1440 | 10 | 800 | 46 | 3680 |
| 16 | | | 17 | 2380 | 7 | 980 | 5 | 700 | 29 | 4060 |
| 18 | | | 7 | 1540 | 5 | 1100 | | | 12 | 2640 |
| 20 | 2 | 640 | 2 | 640 | | | | | 4 | 1280 |
| 22 | 1 | 440 | 3 | 1320 | | | | | 4 | 1760 |
| 24 | | | 1 | 590 | | | | | 1 | 590 |
| 26 | | | | | | | | | 0 | |
| 28 | | | | | | | | | 0 | |
| 30 | | | | | | | | | 0 | |
| 32 | | | 1 | 1440 | | | 1 | 1440 | 2 | 2880 |
| 34 | | | | | | | | | 0 | |
| 36 | | | | | | | | | 0 | |
| 38 | | | | | | | | | 0 | |
| 40 | | | | | | | | | 0 | |
| 42 | | | | | 1 | 3090 | | | 1 | 3090 |
| TOTAL | 3 | 1080 | 74 | 10,100 | 48 | 7120 | 31 | 3390 | 156 | 21,690 |
| Per acre | 1.2 | 430 | 29.6 | 4,040 | 19.2 | 2850 | 12.4 | 1360 | 62.4 | 8,680 |
| % of Risk Vol. | | 4.9 | | 46.5 | | 32.9 | | 15.7 | | 100.0 |

Total Low Risk 51.4

Total High Risk 48.5